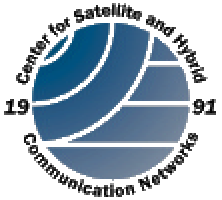

Center for Satellite and Hybrid Communication Networks

Interoperability Challenges for Global Wireless Internetworks

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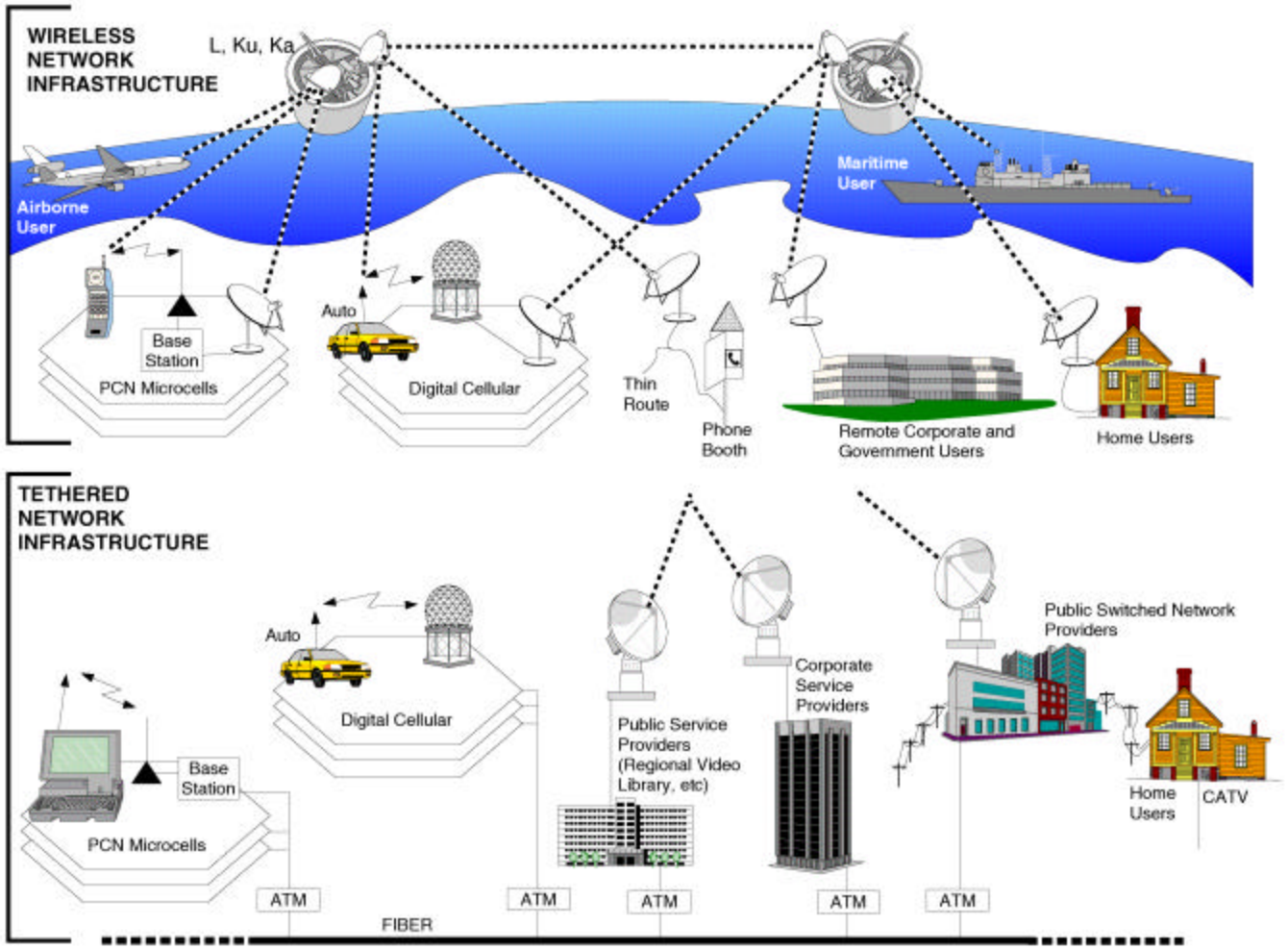
Hybrid Networks

Current and Future Research at the CSHCN

- **Multicasting & caching for hybrid networks**
- **High-data-rate Internet for wireless and satellite**
- **Next Generation Network dimensioning tools**
- **Mulimedia modulation, coding, compression**
- **Group communication security**
- **Hybrid network interoperability**
- **Mobile *adhoc* networks**
- **Network modeling, simulation, performance evaluation**
- **Network management**
- **Indoor wireless networks**



BWI

- **Dramatic progress in high speed networking and various related Information Technologies over last 10 years**
- **Fundamental challenges for making "communicating any-time, from any-where with anybody" a reality**
- **Additional natural requirement of communicating multimedia information adds to the technological, social and financial challenges of realizing this vision**
- **Broadband Wireless Infrastructures (BWI), in-particular Internet-like broadband wireless internetworking, including mobile networks, has emerged as a particularly promising set of technologies tuned to this vision**

A technological development with expected impact equal to that of the PC and of the Internet

BWI: Promises/Advantages

- **Satellite-terrestrial wireless infrastructures can**
  - be rapidly deployed
  - cover large number of connectivity scales from meters to whole earth
- **Offer broadband connectivity to many at very affordable prices**
- **Serve well to connect to and from other terrestrial infrastructures**

BWI: Challenges

- Jointly considering the network and the information moved through it (link the layers)
- Heterogeneity of networks, media/channels, devices, application' QoS, standards, protocols, software implementations of applications, users
- Security and information assurance
- Autonomous and intelligent network operations and management
- Dynamic resource allocation and network dimensioning
- Internet accelerators (it is not just bandwidth)
- High-data-rate to mobiles
- Business models and service pricing

BWI: Obstacles

- **Lack of well defined and high quality standards**
  - **Many wireless standards still around**
  - **Common air interface for SatCom**
  - **Formal specifications of protocols for testing and validation**
- **High degree of heterogeneity in physical media and type of information**
  - **Standards for protocol boosters**
  - **Standard interfaces between heterogeneous media**
  - **Wireless and satellite friendly applications (HTTP, TCP)**
  - **Lack of common information representation for coding, compression, modulation**
  - **Integrated Routing: Mobile IP, Cluster-based, mobile AdHoc, etc.**

BWI: Obstacles (cont.)

- **Security**
  - **IPSEC (layered IPSEC)**
  - **Distributed key generation/distribution (no trusted third parties)**
  - **Distributed trust models and authentication**
  - **Routing**
- **Backward connectivity from mobile *adhoc* and mobile wireless nets to the fixed Internet infrastructure**
- **Scalable reliable multicasting**
  - **Across heterogeneous networks**
  - **Supporting asymmetric and unidirectional routing**
- **Lack of standardized Internet metrology**
  - **Traffic and workload models**
  - **QoS measurement**
  - **Web users and Web page connectivity and update behavior**